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Using multiple datasets to understand trends in serious road traffic casualties

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ABSTRACT

Accurate information on the incidence of serious road traffic casualties is needed to plan and evaluate prevention strategies. Traditionally police reported collisions are the only data used. This study investigate the extent to which understanding of trends in serious road traffic injuries is aided by the use of multiple datasets. Health and police datasets covering all or part of Great Britain from 1996–2003 were analysed. There was a significantly decreasing trend in police reported serious casualties but not in the other datasets. Multiple data sources provide a more complete picture of road traffic casualty trends than any single dataset. Increasing availability of electronic health data with developments in anonymised data linkage should provide a better platform for monitoring trends in serious road traffic casualties.

1. Introduction

Road traffic injuries are the ninth-leading cause of death in the world (World Health Organisation, 2002) and are predicted to become the third leading cause of death and disability worldwide by 2020 (Murray and Lopez, 1996). More than a million lives are lost as a result of such injuries around the world each year and millions more are injured or disabled as a result (Department of Injuries and Violence Prevention, 2002). In Great Britain (England, Wales and Scotland) alone, 3200 people are killed and another 29,000 seriously injured from the 200,000 collisions in which at least one person is injured that occur each year (Department for Transport, 2006).

Road traffic injuries can affect all populations, regardless of age, sex, income, or geographic region (Krug et al., 2000). The economic cost of the problem in Britain is in the region of £13 billion a year (Department for Transport, 2006). The wide-ranging impact of road injuries, and predictions for their incidence to increase, makes the issue a significant public health challenge.

Good quality, accurate and reliable data which are consistently collected over time are needed to inform our understanding of factors affecting the occurrence of road traffic accidents and the injuries to casualties arising from them. Traditionally, analysis has relied on a single dataset collected by the police, which in Great Britain is known as STATS19. It is known that not all casualties arising from road traffic collisions are reported to the police so use of STATS19 on its own is unlikely to provide an accurate reflection of the true risk of being injured on the roads. Some work has been undertaken previously to explore this issue using different sources of data, but that research has been restricted to using one additional dataset selected from a limited number of datasets (Gill et al., 2006; Stephenson et al., 2005; Tunbridge et al., 1988; Bull and Roberts, 1973; Hobbs et al., 1979; Mills, 1989; Nicholl, 1980; Pedder et al., 1981; Saunders and Wheeler, 1987; Simpson, 1996; Haynes et al., 2005).

Given these limitations, the use of multiple data sources, should in theory, improve measurement of trends in serious road traffic injuries. Such information needs to be readily available to help monitor changes in road traffic injury epidemiology, identify any associated wider public health impacts, assess the effectiveness of interventions and track progress against national road safety targets.

Our study aims to investigate the extent to which our understanding of trends in serious road traffic injuries is aided by the use of multiple datasets.

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2. Methods

We used multiple sources of data to compare trends in road traffic casualties overall and by main categories of road user: vehicle occupants, motorcyclists and pedestrians. We did not have access to each of the data sources for exactly the same time periods but for most there were several years of overlap between 1996 and 2003. In Great Britain, police forces complete a set of forms for every road traffic collision reported to them which results in at least one casualty. The electronic record is known as STATS19 and is maintained locally by each police force which then submits records on a regular basis to the Department for Transport who maintain the national STATS19 dataset. STATS19 casualty data were obtained for the period 1996–2003 from local police forces and from the Department for Transport's annual publication on casualty numbers (Department for Transport, 2004).

We used hospital admissions data from England (Hospital Episodes Statistics), Wales (Patient Episode Database for Wales) and Scotland (Scottish Morbidity Record) (1999–2003) for analysis alongside police STATS19 records. In addition, we analysed data from the Trauma Audit and Research Network (TARN) database for the period 1996–2003 (Patel et al., 2005). This dataset comprised a subset of data from 33 hospitals across England and Wales and which have been reliably reporting over this time period. The database holds information on the more severely injured casualties where, amongst other inclusion criteria, the length of stay is at least 72 h. The TARN dataset collects information (dependent on patient's fulfilling the explicit inclusion and exclusion criteria) on the mechanism of injury, road user type and other road traffic accident groups. Unlike hospital inpatient and emergency department datasets which do not routinely contain measures of injury severity the TARN database contains Injury Severity Scores (ISS) which correlate with mortality, morbidity and hospital stay (Baker and O'Neill, 1976).

The definition of a serious road traffic related injury is not standard across datasets. The STATS19 definition of 'serious' injury is much broader than the term 'hospital admission' and includes fractures and other injuries that are treated at specialist clinics as outpatients. Analysis of emergency department (ED) data shows that about 20% of road traffic casualties attending such departments could be considered 'serious' in STATS19 terms and that admissions comprise about half of this category (Ward et al., 2006). However, because computerised ED data are not widely or readily available the most reasonable comparator for STATS19 serious casualties is the incidence of hospital admissions for injuries due to road traffic. It is customary to use killed or seriously injured casualty numbers (KSI) combined for analysis and these are used in government targets. However, as only about 20% of road traffic related deaths occur after admission to hospital, the number of seriously injured casualties is a more appropriate STATS19 comparator for hospital admissions than is KSI (Ward et al., 2006).

We matched ED and STATS19 data for the period 1998–2004 in an English City with only one hospital to aid understanding of differences in total numbers of serious casualties recorded by the police and health services. We applied the police definition of serious to the health service data and counted serious casualties as those admitted to hospital, presenting with fractures or requiring specialist follow-up.

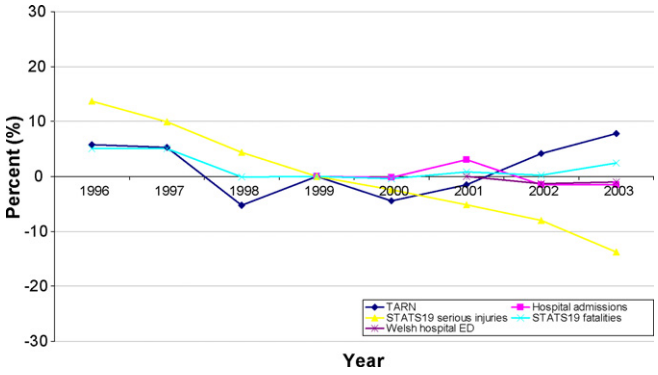

Fig. 1. Percent change in trends of road traffic casualties using data from four datasets, 1996–2003 (2001 reference year for Welsh hospital ED data; 1999 for all other datasets).

We also used data from a large emergency department in Wales to study trends in road traffic casualty attendances from 2001 to 2004. No major changes in emergency department configuration in adjacent hospitals occurred during this period.

To formally make a comparison between datasets, we fitted a set of General Linear Models (GLM's) to incorporate unique intercepts and trends for each dataset. As the datasets record information on different scales we were not interested in the intercept points, focusing instead on the trend lines.

3. Results

3.1. Trends in overall serious road traffic casualties

Table 1 shows the number of road traffic casualties in the different databases available between 1996 and 2003.

As data coverage varied by geography and year the percentage change in each dataset is shown in Fig. 1.

Our application of the GLM showed that all datasets were well fitted by a linear trend line, with four out of the five (Hospital Admissions, Welsh Hospital ED, TARN, STATS19 Fatalities) showing a flat trend (slope not significantly different from zero at the 95% confidence level). Only the STATS19 Serious Injuries dataset was found to have a trend line significantly different from zero ($p < 0.001$), and significantly different from the trends of the other datasets.

In percentage terms the slope of the trends (change per annum) were −0.44% (95% CI −1.1% to 0.2%, $p = 0.2$) for Hospital Admissions; −0.36% (95% CI −19.8% to 19.1%, $p = 0.97$) for ED attendances; 0.18% (95% CI −3.8% to 4.2%, $p = 0.93$) for TARN; and −0.48% (95% CI −3.9% to 2.9%, $p = 0.77$) for STATS19 Fatalities. In contrast, the STATS19 Serious Injuries data indicated a decline in serious injuries of 4.3% per year (95% CI −4.7% to −4.1%, $p < 0.001$).

Table 1
Number of road traffic casualties in different data sources by year from 1996 to 2003

Year	1996	1997	1998	1999	2000	2001	2002	2003
Hospital admissions (GB)	N/A	N/A	N/A	36,034	35,960	37,141	35,491	35,490
STATS19 serious (GB)	44,499	42,984	40,834	39,122	38,155	37,110	35,976	33,707
STATS19 killed (GB)	3598	3599	3421	3423	3409	3450	3431	3508
TARN (33 hospitals)	3089	3072	2766	2919	2788	2876	3042	3147
ED Wales (1 unit)	N/A	N/A	N/A	N/A	N/A	2818	2791	2798
ED England (1 unit))	N/A	N/A	486	565	552	571	465	500